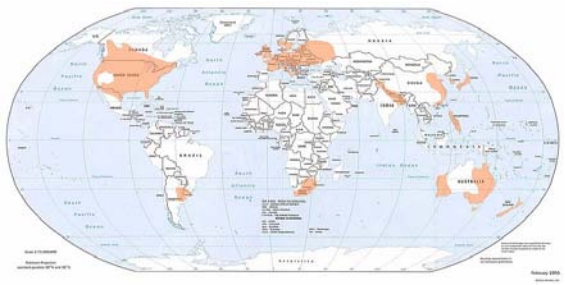
Areas where tornadoes most frequently occur



http://www.ncdc.noaa.gov/img/climate/research/tornado/globdist.jpg

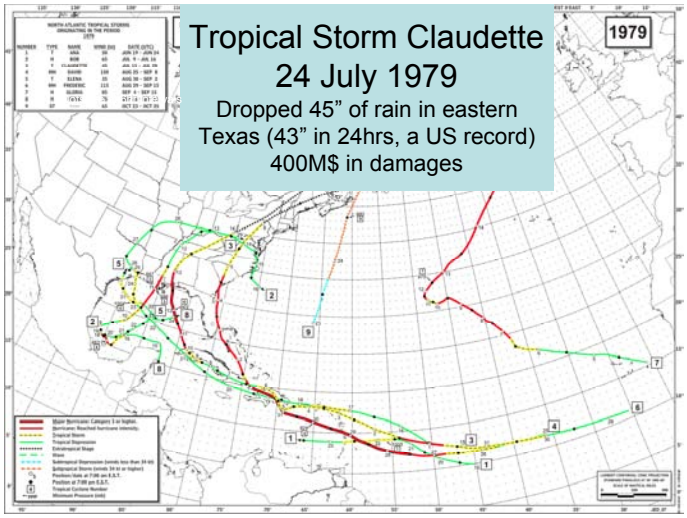
Tornadoes attracted to mobile homes?

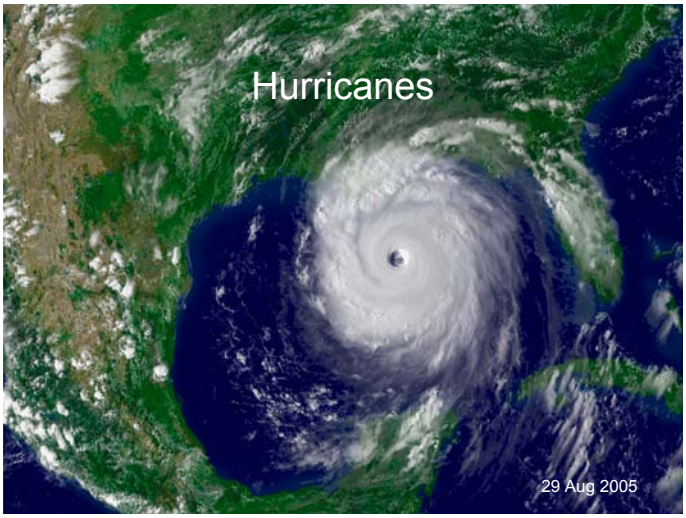
- From 2000–2008, 539 people were killed by tornadoes in the US
  - Half (282) of those killed were in mobile homes
  - Only ~ 6.8% of homes in the US are "manufactured/mobile homes"

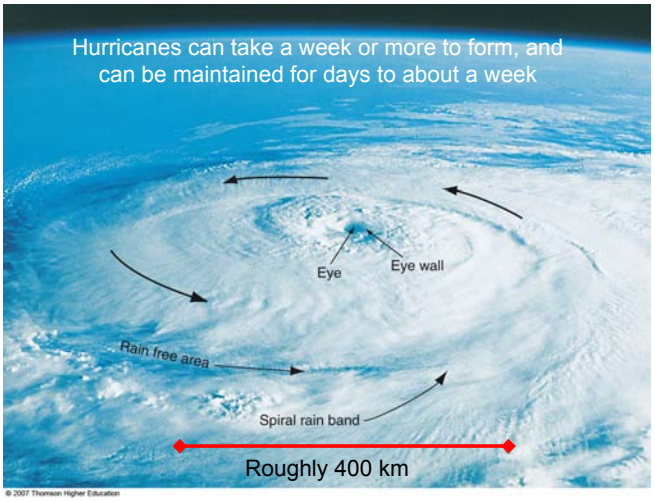
A manufactured home in Maine, done in by a wimpy F0 tornado

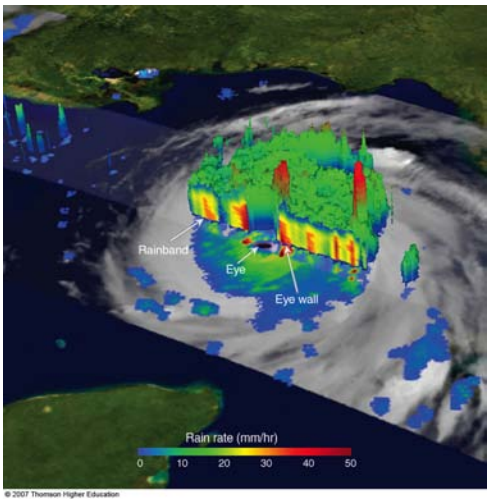
Source: NOAA

Mobile Home Park in Evansville, Illinois after an F3 tornado went through in 2005, killing 25









Life Cycle of a Hurricane

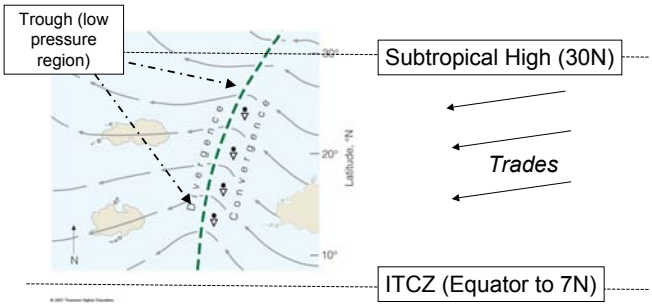
- **Tropical Disturbance** -- a local low pressure that forms on a tropical wave (usually an Easterly Wave, that moves from east to west at about 15 degrees latitude)
- **Tropical Depression** -- when the near surface winds increase to 20-34 kts and a surface low center can be identified
- **Tropical Storm** -- when winds are 35 - 64 kts *(named)*
- **Hurricane** -- when winds exceed 64 kts
  - Hurricane is the Atlantic name
  - Tropical Cyclone is used in the Indian Ocean and Southern Hemisphere
  - Typhoon is used off SE Asia

(10 m/s ~ 19.5 kt ~ 22.4 mph)

Tropical Storms (hurricanes) can last up to two (one) weeks.

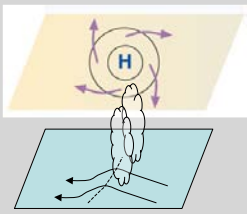
Birth of a Hurricane

- A wave (trough) in the flow gives rise to convection and *lots* of latent heating in the troposphere (surface to tropopause)

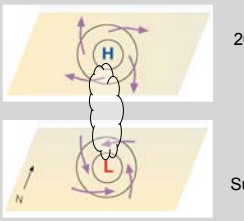


Birth of a Hurricane

- Aloft: The latent heating builds a local region of high pressure and causes air aloft to diverge which, in turn, causes the surface pressure to drop

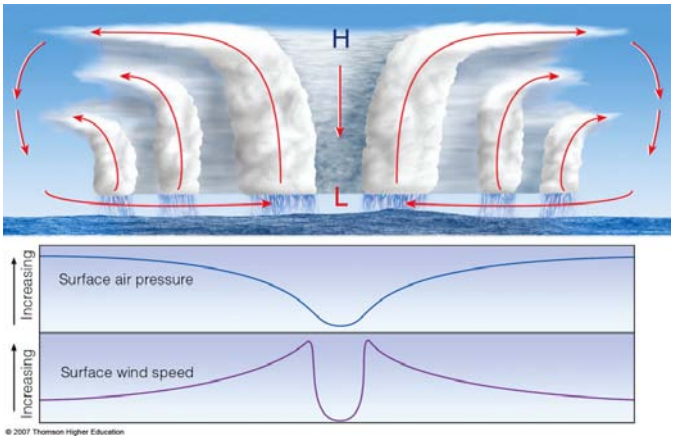


- The surface low pressure causes mainly cyclonic flow near the surface (why?) and a small component of flow into the low (why?)



Birth of a Hurricane

- Evaporation at the surface causes the air to moisten. The moistened air that converges into the low, further fueling the rising motion in the center, condensation, and latent heat release: positive feedback!
- Aloft: this reinforces the high pressure above the convection and causes more air to diverge, hence furhter dropping the surface low.
- Surface: winds increase -> increased evaporation (why?) -> increased air (and moisture) converging in the low -> more condensation -> more latent heat -> etc …
- Key ingredients to grow hurricanes:
  - need lots of moisture (warm ocean water why?)
  - need to keep condensation near the center of the storm. Hence, the vertical wind shear must be weak (otherwise the latent heating will be swept downwind of the surface low pressure system



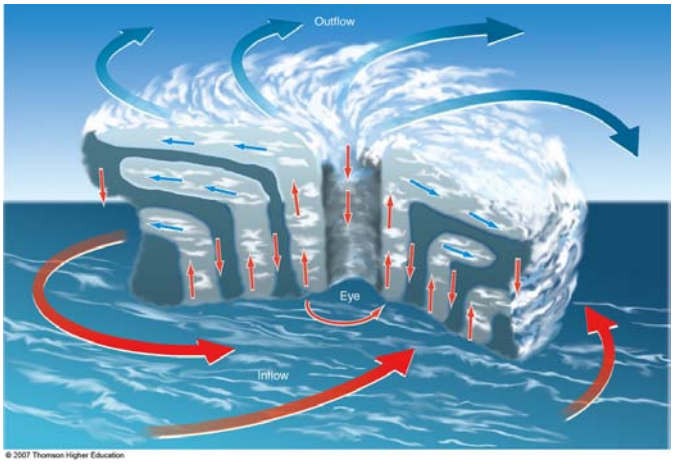


Fig. 15-9, p. 412

Fig. 1, p. 413

Comparison of Cyclones

Tropical Cyclones	Midlatitude Cyclones
• Warm at center • Forms over warm tropical oceans • Energy Source: – latent heat released in condensation (evaporation from the warm oceans) • Strong winds at surface • No fronts • 300 km in diameter	• Cold at center • Forms between cold polar & warm tropical air • Energy Source: – Potential energy associated with temperature contrasts • Strong winds (jets) aloft • Fronts • ~1500 km in diameter

Where do you expect to see Hurricanes?

- Need warm water
- Avoid 30N and 30S (air is in general sinking)
- Avoid the equator (no coriolis effect, so hard to create cyclones)

Where do you expect to see Hurricanes?

- Need warm water. Avoid 30N and 30S. Avoid the equator (no coriolis effect)